

What is claimed is:

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- 1 1. A semiconductor memory card that stores at least one  
2 audio track, comprising:  
3 a protected area that can be accessed by a device  
4 connected to the semiconductor memory card only if the  
5 device has been found to be authentic, the protected area  
6 storing an encryption key sequence composed of a plurality  
7 of encryption keys arranged into a predetermined order;  
8 and  
9 an unprotected area that can be accessed by any device  
10 connected to the semiconductor memory card, the unprotected  
11 area storing at least one audio track and management  
12 information,  
13 the at least one audio track including a plurality  
14 of encrypted audio objects, and  
15 the management information showing which encryption  
16 key, out of the plurality of encryption keys, corresponds  
17 to each audio object stored in the unprotected area.
  - 1 2. A semiconductor memory card according to Claim 1,  
2 wherein the management information shows, for each  
3 audio object, a storage position of the audio object and  
4 a number showing a position in the encryption key sequence  
5 of the encryption key that corresponds to the audio object.

1 3. A semiconductor memory card according to Claim 2,  
2 wherein each audio track further includes  
3 (1) attribute information and  
4 (2) link information  
5 for each audio object included in the audio track,  
6 the attribute information showing a type, out of type  
7 (a), type (b), type (c) and type (d), for each audio object,  
8 type (a) being an entire audio track,  
9 type (b) being a first part of an audio track,  
10 type (c) being a middle part of an audio track, and  
11 type (d) being an end part of an audio track, and  
12 the link information for each audio object that is  
13 type (b) or type (c) showing which audio object follows  
14 the audio object.

1 4. A semiconductor memory card according to Claim 3,  
2 wherein the plurality of audio objects includes:  
3 at least one audio object that only contains valid  
4 data that needs to be played back; and  
5 at least one audio object that contains (1) valid  
6 data and (2) invalid data located at least one of before  
7 and after the valid data, the invalid data not needing to  
8 be played back,  
9 each audio track further including block information  
10 for each audio object in the audio track, the block  
11 information including:

12 an offset measured from the storage position of the  
13 corresponding audio object given in the management  
14 information; and

15 length information showing a length of the valid data  
16 that starts from a position indicated by the offset,  
17 the attribute information for an audio object showing  
18 whether the valid data indicated by the offset and the length  
19 information

20 (a) corresponds to an entire audio track,

21 (b) corresponds to a first part of an audio track,

22 (c) corresponds to a middle part of an audio track,

23 or

24 (d) corresponds to an end part of an audio track.

1 5. A semiconductor memory card according to Claim 4,

2 wherein audio tracks can be played back according  
3 to standard playback or intermittent playback,

4 standard playback being a mode where the valid data  
5 in the audio objects composing the audio tracks is played  
6 back without any valid data being omitted and

7 intermittent playback being a mode where (1) omission  
8 of valid data equivalent to a first period and (2) playback  
9 of valid data equivalent to a second period, are repeated,

10 each audio track further including a plurality of  
11 pieces of entry position information that show internal  
12 positions of the valid data within the audio object at

13 intervals that are equivalent to the first period,  
14 and the block information for an audio object showing:  
15 the offset that indicates a difference between (1)  
16 the internal position shown by a first piece of entry  
17 position information for the audio object and (2) the  
18 storage position for the audio object given in the  
19 management information; and  
20 a length of the valid data that starts at a position  
21 indicated by the offset.

1 6. A playback apparatus for a semiconductor memory card,  
2 the semiconductor memory card including (1) a  
3 protected area that can be accessed by a device connected  
4 to the semiconductor memory card only if the device has  
5 been found to be authentic, the protected area storing an  
6 encryption key sequence composed of a plurality of  
7 encryption keys arranged into a predetermined order, and  
8 (2) an unprotected area that can be accessed by any device  
9 connected to the semiconductor memory card, the unprotected  
10 area storing at least one audio track and management  
11 information, the at least one audio track including a  
12 plurality of encrypted audio objects, and the management  
13 information showing which encryption key, out of the  
14 plurality of encryption keys, corresponds to each audio  
15 object stored in the unprotected area,  
16 the playback apparatus comprising:

17 reading means for reading one of the plurality of  
18 audio objects included in the at least one audio track from  
19 the semiconductor memory card and reading an encryption  
20 key that corresponds to the read audio object from the  
21 encryption key sequence stored in the protected area of  
22 the semiconductor memory card;

23 decrypting means for decrypting the read audio object  
24 using the read encryption key; and

25 playback means for playing back the decrypted audio  
26 object,

27 wherein when the decrypting means has finished  
28 decrypting the read audio object, the reading means

29 reads a different audio object included in an audio  
30 track,

31 reads an encryption key corresponding to the different  
32 audio object from the encryption key sequence, and

33 supplies the newly read encryption key to the  
34 decrypting means.

1 7. A recording apparatus for recording a title composed  
2 of a plurality of contents onto a semiconductor memory card,  
3 the recording apparatus comprising:

4 encrypting means for assigning at least one of a  
5 plurality of encryption keys to each content included in  
6 the title, and encrypting each content using the encryption  
7 keys assigned to the contents to produce a plurality of

8 audio objects; and  
9 recording means for recording onto the semiconductor  
10 memory card the plurality of encryption keys as an  
11 encryption key sequence and the plurality of audio objects  
12 as at least one audio track.

1 8. A recording apparatus according to Claim 7,  
2 wherein after recording the plurality of encryption  
3 keys and the plurality of audio objects, the recording means  
4 also records management information onto the semiconductor  
5 memory card, the management information showing, for each  
6 audio object, correspondence between a region on the  
7 semiconductor memory card storing the audio object and a  
8 storage position of the encryption key corresponding to  
9 the audio object.

1 9. A recording apparatus according to Claim 8,  
2 wherein for each audio object, the recording means  
3 also records attribute information and link information  
4 onto the semiconductor memory card,  
5 the attribute information for each audio object  
6 showing a type, out of type (a), type (b), type (c) and  
7 type (d),  
8 type (a) being an entire audio track,  
9 type (b) being a first part of an audio track,  
10 type (c) being a middle part of an audio track,

11 and  
12 type (d) being an end part of an audio track,  
13 and  
14 the link information for each audio object that is  
15 type (b) or type (c) showing which audio object follows  
16 the audio object.

1 10. A recording apparatus for a semiconductor memory card,  
2 comprising:

3 first generating means for successively generating  
4 audio frames from an input signal received from outside  
5 the recording apparatus, an audio frame being a smallest  
6 amount of data that can be independently decoded;

7 writing means for creating a file on the  
8 semiconductor memory card and writing the successively  
9 generated audio frames into the file;

10 second generating means for generating, whenever  
11 the writing means has written a predetermined number of  
12 audio frames into a file, a piece of entry information  
13 showing a data length of an audio element that is composed  
14 of the audio frames written into the file,

15 wherein whenever the second generating means has  
16 generated a predetermined number of pieces of entry  
17 information, the writing means creates a new file and writes  
18 the audio frames successively generated thereafter into  
19 the new file.

1 11. A computer-readable storage medium storing a program  
2 which, when executed by a computer, has the computer play  
3 back data from a semiconductor memory card,

4 the semiconductor memory card including (1) a  
5 protected area that can be accessed by a device connected  
6 to the semiconductor memory card only if the device has  
7 been found to be authentic, the protected area storing an  
8 encryption key sequence composed of a plurality of  
9 encryption keys arranged into a predetermined order, and  
10 (2) an unprotected area that can be accessed by any device  
11 connected to the semiconductor memory card, the unprotected  
12 area storing at least one audio track and management  
13 information, the at least one audio track including a  
14 plurality of encrypted audio objects, and the management  
15 information showing which encryption key, out of the  
16 plurality of encryption keys, corresponds to each audio  
17 object stored in the unprotected area,

18 the program comprising:

19 a reading step for reading one of the plurality of  
20 audio objects included in the at least one audio track from  
21 the semiconductor memory card and reading an encryption  
22 key that corresponds to the read audio object from the  
23 encryption key sequence stored in the protected area of  
24 the semiconductor memory card;

25 a decrypting step for decrypting the read audio object  
26 using the read encryption key; and



27 a playback step for playing back the decrypted audio  
28 object,

29 wherein when the decrypting step has finished  
30 decrypting the read audio object, the reading step  
31 reads a different audio object included in an audio  
32 track,

33 reads an encryption key corresponding to the different  
34 audio object from the encryption key sequence, and  
35 supplies the newly read encryption key to the  
36 decrypting step.

1 12. A computer-readable storage medium storing a program  
2 which, when executed by a computer, has the computer record  
3 data onto a semiconductor memory card,

4 the program including:

5 an encrypting step for assigning at least one of  
6 a plurality of encryption keys to each content included  
7 in the title, and encrypting each content using the  
8 encryption keys assigned to the contents to produce a  
9 plurality of audio objects;

10 a recording step for recording onto the semiconductor  
11 memory card the plurality of encryption keys as an  
12 encryption key sequence and the plurality of audio objects  
13 as at least one audio track.

1 13. A computer-readable storage medium according to Claim

2 12,

3        wherein after recording the plurality of encryption  
4 keys and the plurality of audio objects, the recording step  
5 also records management information onto the semiconductor  
6 memory card, the management information showing, for each  
7 audio object, correspondence between a region on the  
8 semiconductor memory card storing the audio object and a  
9 storage position of the encryption key corresponding to  
10 the audio object.

1 14. A computer-readable storage medium according to Claim  
2 13,

3        wherein for each audio object, the recording step  
4 also records attribute information and link information  
5 onto the semiconductor memory card,

6        the attribute information for each audio object  
7 showing a type, out of type (a), type (b), type (c) and  
8 type (d),

9                type (a) being an entire audio track,

10               type (b) being a first part of an audio track,

11               type (c) being a middle part of an audio track,

12               and

13               type (d) being an end part of an audio track,

14 and

15        the link information for each audio object that is  
16 type (b) or type (c) showing which audio object follows

17 the audio object.

1 15. A computer-readable storage medium storing a program  
2 which, when executed by a computer, has the computer record  
3 data onto a semiconductor memory card,

4 the program comprising

5 a first generating step for successively generating  
6 audio frames from an input signal received from outside  
7 the recording apparatus, an audio frame being a smallest  
8 amount of data that can be independently decoded;

9 a writing step for creating a file on the  
10 semiconductor memory card and writing the successively  
11 generated audio frames into the file;

12 a second generating step for generating, whenever  
13 the writing step has written a predetermined number of audio  
14 frames into a file, a piece of entry information showing  
15 a data length of an audio element that is composed of the  
16 audio frames written into the file,

17 wherein whenever the second generating step has  
18 generated a predetermined number of pieces of entry  
19 information, the writing step creates a new file and writes  
20 the audio frames successively generated thereafter into  
21 the new file.

1 16. A playback method for playing back data from a  
2 semiconductor memory card,

3           the semiconductor memory card including (1) a  
4   protected area that can be accessed by a device connected  
5   to the semiconductor memory card only if the device has  
6   been found to be authentic, the protected area storing an  
7   encryption key sequence composed of a plurality of  
8   encryption keys arranged into a predetermined order and  
9   (2) an unprotected area that can be accessed by any device  
10   connected to the semiconductor memory card, the unprotected  
11   area storing at least one audio track and management  
12   information, the at least one audio track including a  
13   plurality of encrypted audio objects, and the management  
14   information showing which encryption key, out of the  
15   plurality of encryption keys, corresponds to each audio  
16   object stored in the unprotected area,

17           the playback method comprising:

18           a reading step for reading one of the plurality of  
19   audio objects included in the at least one audio track from  
20   the semiconductor memory card and reading an encryption  
21   key that corresponds to the read audio object from the  
22   encryption key sequence stored in the protected area of  
23   the semiconductor memory card;

24           a decrypting step for decrypting the read audio object  
25   using the read encryption key; and

26           a playback step for playing back the decrypted audio  
27   object,

28           wherein when the decrypting step has finished

29 decrypting the read audio object, the reading step  
30 reads a different audio object included in an audio  
31 track,  
32 reads an encryption key corresponding to the different  
33 audio object from the encryption key sequence, and  
34 supplies the newly read encryption key to the  
35 decrypting step.

1 17. A recording method for recording a title composed of  
2 a plurality of contents onto a semiconductor memory card,  
3 the recording method comprising:  
4 an encrypting step for assigning at least one of a  
5 plurality of encryption keys to each content included in  
6 the title, and encrypting each content using the encryption  
7 keys assigned to the contents to produce a plurality of  
8 audio objects; and  
9 a recording step for recording onto the semiconductor  
10 memory card the plurality of encryption keys as an  
11 encryption key sequence and the plurality of audio objects  
12 as at least one audio track.

1 18. A recording method according to Claim 17,  
2 wherein after recording the plurality of encryption  
3 keys and the plurality of audio objects, the recording step  
4 also records management information onto the semiconductor  
5 memory card, the management information showing, for each

6 audio object, correspondence between a region on the  
7 semiconductor memory card storing the audio object and a  
8 storage position of the encryption key corresponding to  
9 the audio object.

1 19. A recording method according to Claim 18,

2 wherein for each audio object, the recording step  
3 also records attribute information and link information  
4 onto the semiconductor memory card,

5 the attribute information for each audio object  
6 showing a type, out of type (a), type (b), type (c) and  
7 type (d),

8 type (a) being an entire audio track,

9 type (b) being a first part of an audio track,

10 type (c) being a middle part of an audio track,

11 and

12 type (d) being an end part of an audio track,

13 and

14 the link information for each audio object that is  
15 type (b) or type (c) showing which audio object follows  
16 the audio object.

1 20. A recording method for recording data onto a

2 semiconductor memory card, comprising

3 a first generating step for successively generating

4 audio frames from an input signal received from outside

5 the recording apparatus, an audio frame being a smallest  
6 amount of data that can be independently decoded;

7 a writing step for creating a file on the  
8 semiconductor memory card and writing the successively  
9 generated audio frames into the file;

10 a second generating step for generating, whenever  
11 the writing step has written a predetermined number of audio  
12 frames into a file, a piece of entry information showing  
13 a data length of an audio element that is composed of the  
14 audio frames written into the file,

15 wherein whenever the second generating step has  
16 generated a predetermined number of pieces of entry  
17 information, the writing step creates a new file and writes  
18 the audio frames successively generated thereafter into  
19 the new file.